
The CRUSHED STONE JOURNAL

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The National Crushed Stone Association

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A Resume of the Montreal Convention

When President Graves called to order the ninth annual convention of the National Crushed Stone Association he was undoubtedly faced by the most enthusiastic and representative body over which it has ever been the privilege of a President of this Association to preside. He indeed would be unimaginative who, looking into the faces of that assemblage of earnest and sincere men, gathered together from all parts of the United States and Canada, could not visualize the almost unlimited potential possibilities for service which this Association offers to the crushed stone industry.

We were very graciously welcomed to the City of Montreal by His Worship, Mr. Charles Duquette, Mayor of the city. He extended to us a very cordial invitation to make ourselves thoroughly at home and expressed the hope that we would find time between our deliberations to see many of the historical and unusual points of interest in and around Montreal.

In the presidential address, our President, Mr. Graves, with his customary forceful manner and eloquent speech, outlined the various activities of the Association during the past year. He paid glowing tribute to the Directors, the Executive Committee and the Chairmen of the various Standing Committees for their loyalty and self-sacrifice, without which the exceptional progress made during the past year could not have been accomplished. President Graves briefly discussed the establishment of our Bureau of Engineering and emphasized the unusual opportunities for service to the users of crushed stone afforded by this Bureau, not losing sight of the fact, however, that any service rendered to the user would ultimately reflect itself as a benefit to the entire industry.

The Directors' Reports, with hardly an exception, showed that the Industry had enjoyed a prosperity comparable to that of 1924 and in some instances exceeding it. The Directors were practically unanimous in their opinion that the outlook for 1926 is very promising.

Mr. Goldbeck in his paper on "Proposed Research Work of the Association," presented for the consideration of the convention a very clear and comprehensive program of activities to be undertaken by the Bureau of

Engineering in the near future. The discussion elicited by this paper contained many suggestions which will be helpful to Mr. Goldbeck in the conducting of the work of the Bureau.

Following the discussion on Mr. Goldbeck's paper we had the pleasure of hearing Mr. Hogentogler give a summary of the report on "The Economic Value of Steel Reinforcement in Concrete Roads," recently conducted by the Highway Research Board of the National Research Council. The Highway Research Board, through the medium of this report, has certainly contributed a very valuable addition to the literature on the subject of Highway Design and we are deeply indebted to Mr. Hogentogler for coming to Montreal and giving to us the substance of this valuable report.

Mr. Blaum in discussing this report earnestly requested the cooperation of crushed stone producers in seeing that the broken stone which is furnished for use in concrete pavements complies with the following two requirements: 1. That the product delivered is clean. 2. That the product delivered conforms to the specification requirements with respect to sizing. The suggestions made by Mr. Blaum certainly deserve the careful consideration of all those producing crushed stone.

Major Ripley in his charming and entertaining manner gave us a very excellent talk on "What a Highwayman Thinks of the Use of Production of Crushed Stone." Contrary to what might be expected of a "Highwayman," Major Ripley stressed the idea of service and co-operation, pointing out that stone producers can render service to highwaymen not only in prompt delivery but also in quality of product as regards cleanliness, kind and size required.

While strolling across the Hotel Lobby about 7:30 Monday evening the usual tranquil atmosphere was suddenly rent by a number of terrific and continuous blasts emanating apparently from some type of horn. Realizing that the Montreal Harbor had been frozen for sometime and that therefore the disturbance could not be coming from a ship in distress we became somewhat alarmed, as, momentarily forgetting that we were

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J. R. BOYD, Editor

A. T. GOLDBECK, Director, Bureau of Engineering

The National Crushed Stone Association

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ROCK DUST SAVES MANY LIVES

CHICAGO, Jan. 29.—(A. P.)—Rock dust prepared and placed as an accident prevention measure smothered an explosion today in the world's greatest coal mine and turned what otherwise might have been a serious disaster with 1,235 men underground, into a minor accident which cost five lives. The accident occurred in the New Orient mine of the Chicago, Wilmington and Franklin Coal Company at West Frankfort, Ill.

The great mine, which has a hoisting capacity of 12,000 tons a day, was planned throughout, workings, shafts and surface structures, before the first breaking of ground. Into the plans went the newest safety measures.

Rock Dust Distributed

At strategic points throughout the workings rock dust is stored in platforms easily tilted by the slightest rush of air from an explosion. It was that today which filled the air with non-combustible, non-explosive stone particles and confined the effects to the immediate vicinity of the explosion. In addition to the piles of rock dust, the dust is scattered on the floors of the entries, keeping the explosive coal dust from getting into the air.

The panel system is used in the dimensions permitting rooms to be worked out in the coal with one set of workers protected from the others or accidents by great barrier pillars with comparatively small openings.

The workings are all on one level 500 feet underground and the vein of coal averages nine feet six inches in thickness.—Extract from Pittsburgh Gazette Times, Saturday, January 30, 1926.

T. M. BARROWS, EXECUTIVE SECRETARY OF THE NATIONAL SAND AND GRAVEL ASSOCIATION, DIES AT CONVENTION

It is with sincere and deep regret that we learn of the passing of Mr. T. M. Barrows, Executive Secretary of the National Sand and Gravel Association. While in attendance at the Atlanta convention, Mr. Barrows contracted an illness which resulted in his sudden death in that city on January 31, 1926.

In his death the National Sand and Gravel Association has lost a capable and willing worker, and one who sincerely had the interests of that Association at heart.

THE MOUNT ROYAL HOTEL

We wish to express our sincere appreciation to the management and entire personnel of the Mount Royal Hotel for the courteous and efficient service rendered in connection with our Convention. The spirit of co-operation which was continually evident did much to make our visit to Montreal a thoroughly enjoyable one, and our Convention an unqualified success.

THE MONTREAL TOURIST AND CONVENTION BUREAU

Too much credit cannot be given to this organization for their untiring efforts on our behalf. We are particularly indebted to Mr. Mathewson and Mr. McNamee for the personal effort which they put forth in attending to many of the details of the convention.

RECOVERY OF MAGNESIA FROM DOLOMITE

Those members of the Association who produce dolomite will be interested in a paper on "Magnesite and Magnesia," to be presented before the coming annual meeting of the American Institute of Mining and Metallurgical Engineers. Prof. Hugh M. Henton of the State College of Washington is the author, and the paper is said to describe, for the first time, a successful means for the recovery of magnesia from dolomite. Preprints of this paper probably can be procured for those interested.

ADDITIONAL COPIES OF THE CRUSHED STONE JOURNAL

Each firm, company, or individual is entitled to receive one copy of each issue of the Crushed Stone Journal for each membership held in the Association. Additional copies may be obtained from the Secretary's Office at the rate of ten cents per copy.

The Bulking of Sand and its Effect on Concrete

By A. T. GOLDBECK, *Director*

Bureau of Engineering
National Crushed Stone Association

Although the phenomenon of the swelling or bulking of sand due to moisture has been definitely known since 1892, when it was investigated in the French School of Bridges and Roads by Feret, its practical significance and application to concrete proportioning have not until recently been recognized by the engineering profession. In the past thirty-three years a number of investigators have announced the results of tests showing that moist sand occupies greater volume than dry sand. But even today it is an extremely rare occurrence to find the slightest hint in concrete specifications of this well established effect of moisture on the volume of sand. Yet it is undoubtedly true that this omission from specifications in many instances has resulted in financial loss to the contractor because of a smaller yield of concrete than he should have obtained, in unsatisfactory work because an extremely harsh working concrete has resulted, and, finally, in lower strength than should have been obtained because the contractor has used more water than was necessary in an effort to obtain concrete having greater workability. The whole subject of sand measurement is, therefore, a most important one and merits thorough discussion and full recognition, for upon it in large part depend the production of harsh or workable concrete, the financial gain or loss by the contractor and finally the attainment of the particular strength and quality of concrete desired.

The Measurement of Sand

It must be apparent to everyone that the effect of sand on the properties of concrete is largely dependent upon its solid content and when we proportion concrete we should be interested in seeing that we have a given quantity of the solid portion of the sand rather than a given number of cubic feet of sand as we know it commercially. It does not at all follow that because we have filled a measure with sand in successive batches each batch will contain the same cubical content of solid matter, even though the sand be absolutely uniform in grading, for much depends upon the manner of filling the measure, and also upon the moisture in the sand. To illustrate the effect of the method of compaction of sand into a cubic foot measure, a large series of tests were made in a number of different laboratories. The average results obtained with the different methods of measurement used were as follows:

VARIATION IN WEIGHT PER CUBIC FOOT OF SAND DUE TO CONDITION OF DRYNESS AND METHOD OF MEASUREMENT

Method	Coarse Sand		Fine Sand	
	Dry	Wet	Dry	Wet
A Filled and Struck (approximates field practice)	101.6	92.6	91.6	81.0
B Filled and Jarred.....	109.3	104.3	98.6	93.4
C Jarred while Filling.....	112.4	108.2	103.7	97.5
D Tamped in Layers.....	111.4	110.5	103.5	100.6
E Filled and Tamped.....	103.9	103.9	98.2	93.9
H Rod Method (present laboratory practice)	108.1	94.3	99.9	84.6

NOTE: A complete report of these tests is given on page 340, Vol. XX, Part I, 1920 Proceedings of the American Society for Testing Materials.

This table well illustrates the fact that the actual weight of sand will vary greatly depending upon the method of compaction in the measure and upon its condition of dryness. From these results it is apparent that the maximum weight of dry, coarse sand per cubic foot might be 112.4 pounds as against a minimum of 101.6 pounds, a difference of 10.8 pounds or 10.6 per cent on the basis of the lowest weight due alone to the method of compaction in the measure. And this is merely an example and not necessarily the maximum difference to be expected. The wet coarse sand shows a variation of from 92.6 to 110.5, a difference of 17.9 pounds or 19.3 per cent, again due merely to the different methods of measurement. In the laboratory a standard practice has been adopted for measuring sand. It corresponds to method "H" in the above table and involves the filling of a cubic foot measure with dry sand in three layers, rodding each layer 25 times with a standard bullet-pointed rod. In the field the method of measurement is entirely different.

Perhaps the most used practice at the present time is that of volumetric measurement of sand in a more or less loose condition such as would be obtained in a measure filled from an overhead hopper and corresponding closely with method "A." Laboratory and field methods give widely different results. There is thus much less actual solid content in a given volume of sand measured in the field than in the laboratory, first because of dif-

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ference in compaction, and second, because of the swelling effect of moisture. Obviously, if the proportions of concrete as determined in the laboratory are correct, those same proportions used in the field will be seriously wrong and lacking in sand unless the differences in methods of measurement are realized and a suitable correction is made.

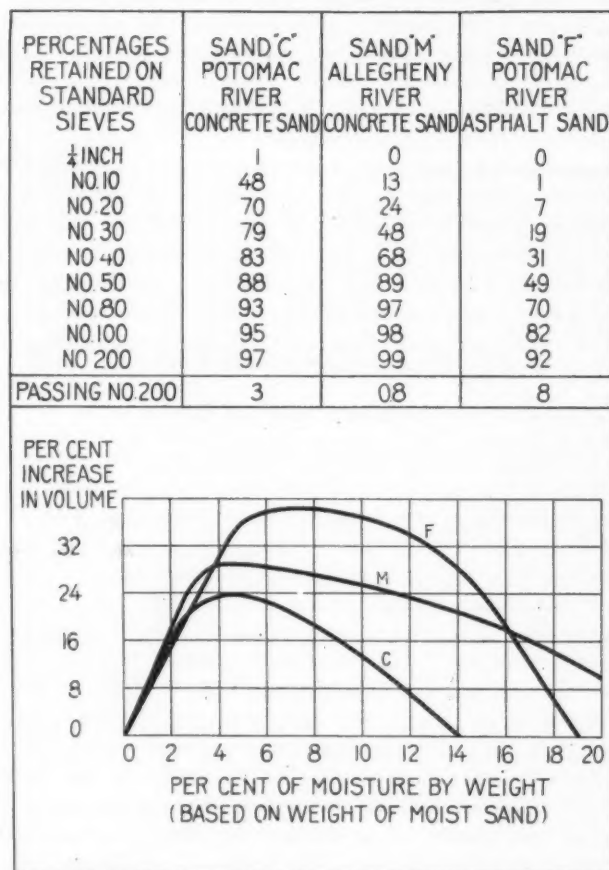
Influence of Moisture

The influence of moisture on the change of volume of sand is even more important than the influence of method of measurement. A number of tests have been made in the past and the results obtained are typified by those in Figure I, showing the effect of moisture on a fine, medium and coarse sand.* It will be noted that from a dry condition to 5 per cent of moisture, sand increases in bulk very rapidly. As more water is added, the sand shows greater volume each time it is put back into the measure. Finally it reaches a maximum volume after which the additional water serves to decrease its volume, and, when it is in a saturated condition, it has almost the same volume as when dry. Sands such as are considered suitable for concrete road construction might swell more than 25 per cent above their dry volume. In other words, if a batch of concrete requires four cubic feet of dry sand, five cubic feet of moist sand might have to be used to produce concrete of the required proportions. If, in this illustration, only four cubic feet of sand in a loose, moist condition be used, the concrete will be lacking in sand and this will result in a lower concrete yield.

Moreover, the use of more cement per cubic yard of concrete will be required and because of its harshness it will be difficult to place. This is likely to lead to the use of too much water in order to promote workability and the concrete is likely to be too low in strength. The absurdity of our present-day specifications which arbitrarily specify given volumes of cement, sand and coarse aggregate without any mention whatsoever of the condition of the sand as to moisture must be apparent. Fortunately, many engineers are beginning to recognize the importance of this subject and weight measurement and measurement by inundation are beginning to be used. Some engineers permit additional sand when volumetric measurement is used in order to compensate for the errors above mentioned. Weight measurement is a satisfactory field method and the error involved is only that of the weight of water present. Thus, if the sand contains 3 per cent of water there will be a deficiency of only 3 per cent of sand in the batch and a correction can even be made for this. On the other hand, 3 per cent of water might cause an error of 20 to 25 per cent when

volumetric measurement is used. The inundation scheme consists of volumetric measurement of the sand in a saturated condition with the voids filled with water. In this condition, for all practical purposes, sand has the same volume as when dry, but the proper relation of dry compacted sand to inundated sand should be established when this method is used.

It is possible to obtain sufficiently accurate measurement in the field with the most commonly used volumetric means, by weight measurement and by inundation, but whatever the means employed the aim should be to attain a high degree of uniformity in the measurement of successive batches. Each batch should contain the same quantity of solid sand, irrespective of its moisture condition. Finally, specifications for concrete should state definitely the methods of measurement of both fine and coarse aggregate upon which the concrete proportion have been based, and if these methods differ from the field methods the concrete proportions should be set in the field to accurately reflect these differences.



* NOTE: Tests made by U. S. Bureau of Public Roads; see Public Roads, July, 1924, page 21. The Bulking of Moist Sands by A. A. Levison.

Figure I—Curves showing the bulking of three different sands due to various percentages of moisture.

Gems from the Montreal Convention

His Worship, Charles Duquette, Mayor of Montreal: "The Mayor of the City of Montreal cannot give you the key of the city (as many Mayors in other cities do) because there is no door and consequently no key. I can, however, give you the city itself and I hope you will enjoy it."

President Graves in his Presidential address: "— the Bureau of Engineering must seek to serve the users of our material and not seek to serve us. I believe as firmly as I believe I am standing on this platform, that if the Bureau does exactly this, efficiently, effectively, and sympathetically and devotes itself to serving the interests of the users of our product, it could not in any conceivable way better serve our own interests."

Regional Vice-President C. M. Doolittle (Canadian): "I want to take this opportunity of putting my company on record as being much impressed with the value of such conventions as this of the National Crushed Stone Association. The information gained at such meetings is often of great value. As an instance of this, last year at Cincinnati we learned better methods of educating public opinion as to the merits of crushed stone. Other operators, members of this Association, had been up against the same problems we were facing in Ontario. They told us what methods had been most successful with them, and I am happy to say, after applying these methods we can see a decided improvement in the attitude towards the more extensive use of crushed stone."

Mr. N. S. Greensfelder, Board of Directors, Manufacturer's Division: "We in the Manufacturer's Division believe that the Association has taken a great forward step in establishing an Engineering Bureau, headed by a man with the ability and reputation possessed by Mr. A. T. Goldbeck. We appreciate the opportunity to support you in this move and we propose to continue to work shoulder to shoulder with you in attacking the problems which confront your industry."

Mr. A. T. Goldbeck, Director, Bureau of Engineering: "Your Bureau holds an attitude of helpfulness not only to the industry, but also to all users of your product. In generous measure we stand ready to aid the using public in any solution of their problems pertaining to stone, and to assist in any practicable manner in the development of better design, better standards of construction,

and better specifications. These are things which we, as a National body, should contribute to the general good, for in so doing we maintain our respect as a nationally useful organization."

Major Theron M. Ripley, Division Engineer, New York State Department of Public Works: "The budget which President Graves spoke of this morning, is well worth while and I firmly believe that every dollar that you put into your Engineering Bureau will return to you many fold. The output of crushed stone in the United States for the year just ended will be in the neighborhood of 100,000,000 tons of which about 75,000,000 will be produced by your member organization. One cent per ton on the basis of this output would give your organization an income of \$750,000 per annum. Fellows, if you could come across with this kind of a budget you would have the natives of the United States eating rock soup."

Colonel W. M. Acheson, New York State Department of Public Works: "The Crushed Stone Association of the United States represents one of the chief factors in highway construction. Its product is probably used in greater volume than any other material that is used in the building of our highways. You have a duty to perform and that duty calls upon you to put forth your best efforts that the best product obtainable is developed, that the best modern methods are used in order that it may be economical. Bear this in mind always, no industry can survive that is not profitable. It means that cut-throat competition must be eliminated. The field is so broad that the liberal exchange of thought and ideas on the most modern methods advances your industry as a whole."

Mr. W. R. Sanborn, Regional Vice-President (Northern): "When this Association will take the pains to compile, state by state, the absolutely true facts as to the output of our members, we will have ammunition which will bear some weight, more weight in fact on an Interstate Commerce Commission than any other one thing I can well imagine. And, I do not see how it can injure any of us. I did not feel it would injure me in any way and I put in an exhibit as an individual quarrryman. * * * I hope that we as individuals may all profit by the situation which has arisen and be more liberal in our responses when the Association feels it is necessary to gather information for our own good and protection."

Local Association Activities

New York State Crushed Stone Association

The regular monthly meeting of the New York State Crushed Stone Association was held on Friday, December 18th, at the Ten Eyck Hotel, Albany, N. Y., with twenty-four members present.

The meeting was called to order by President Sporgborg at 10:45 a. m.

The minutes of the previous meeting were read and approved.

The Treasurer's report was submitted and adopted.

The Secretary's report for the years 1924 and 1925 was submitted and adopted. This report is such an excellent illustration of the value of local associations that it is given practically in its entirety as follows:

To the Members of the New York State Crushed Stone Association,

Gentlemen:

I have the honor to submit to you my report as Secretary of this Association for the years 1924 and 1925. In this period we held 19 meetings, 10 in 1924 and 9 this year. Our average attendance per meeting last year was 20. This year our average increased to 22. The membership increased from 10 at the first meeting in the spring of last year to over 50 at the present time.

It is unnecessary to give a detailed report of all of the activities of the Association during the past 2 years for this is shown in the Secretary's record book. However, it is worthy of note to enumerate some of the outstanding features which have been taken up by this Association.

Discussed new legislative bills pertinent to our industry supporting some and opposing others.

Negotiated with Insurance Companies relative to downward revisions in premiums for Workman's Compensation Liability.

Watched tariffs for freight rate revisions, and handled in particular the discriminations by certain carriers in publishing crushed gravel rates on 10c per ton lower basis than stone.

Voted in favor of present structure of freight rate establishment and opposed tentative changes to a mileage or zone basis.

Met with other state stone associations relative to standardization of sizes and research work in connection with the use of stone versus gravel in concrete pavement construction.

Met with State and County highway officials to promote a better mutual understanding, insure greater production, better quality of product, uniformity of shipments throughout the season rather than peak loads in Spring and Fall, more adequate deliveries.

Mid-West Division

On December 18 at the University Club, Chicago, the Mid-West Division of the National Crushed Stone Association held the largest meeting in its history. Col. Chamberlain presided and immediately called upon President Graves who discussed very fully the plans for the Convention in Montreal. The proposed work of the Bureau of Engineering was then described by Mr. Goldbeck who laid particular emphasis on the policies which he felt would have to be followed in carrying on the work of the Bureau successfully. Ex-president Sloan gave a very interesting talk delivered in his characteristically forceful manner and other members also spoke very enthusiastically of the plans of the Association. High interest was displayed by all present and as a result there was abundant discussion.

Assisted National Crushed Stone Association in railroad matters in this state, and before the Interstate Commerce Commission at Washington.

Procured approximately 25 new members of the National Crushed Stone Association.

Contributed \$6,000.00 for each of 3 years as our share of new Bureau of Engineering and Research at Washington.

Deplored the action of some State and County penal institutions in selling stone commercially in competition with regular commercial quarries.

Kept in touch with matters vital to our industry, developing same where necessary and transmitting information to our membership.

Assisted each other on shipments where necessary so that maximum service could be rendered irrespective of with which firm order had been originally placed.

Visited and inspected 20 stone quarries and 3 gravel plants interchanging ideas for betterment of production methods.

Best of all endeavored to inculcate in the minds of each individual producer that the promotion of crushed stone is paramount, that we are all in the business to prosper and succeed and that each of us have our own inalienable rights. We ironed out petty difficulties, tried to erase little jealousies and are confident that a feeling of loyalty to the industry as a whole is now present among all of us, and also that this New York State Association now ranks on a par with any other one in our great nation.

Respectfully,
(Signed) GEO. E. SCHAEFER,
Secretary.

The Committee on By-Laws, through Mr. Seitz, presented for the consideration of the meeting a constitution which was duly adopted.

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An Analysis of the Montreal Registration

The following analysis of the registration at the Montreal Convention gives conclusive evidence that our Association is national in fact as well as in name.

In column I there is given the total registration per state and for Canada. Columns II, III and IV, respectively, show the number of delegates connected with active firms, the number of delegates connected with associate firms, and the number of guests. Columns V and VI show the active and associate firms represented at the convention. Columns VII and VIII show the number of active and associate firms on record in the Secretary's Office. Columns IX and X show the per-

centage of active and associate firms represented at the Convention. It should be noted that in many instances delegates registered from one state, represented companies located in some other state. Whenever this occurred the delegate has been listed under the state from which he actually registered and the company has been credited as being represented under the state in which the headquarters of the company are located.

Our total registration at this Convention was 385. Next year it should exceed 500. This can be easily accomplished if everyone will see to it that his state is represented 100 per cent.

TABLE SHOWING DISTRIBUTION OF THE MONTREAL REGISTRATION

State	I Total Registered	II Delegates from Active Firms	III Delegates from Associate Firms	IV Guests	V Active Firms Represented	VI Associate Firms Represented	VII No. of Active Firms in Association	VIII No. of Associate Firms in Association	IX Percentage of Active Firms Represented	X Percentage of Associate Firms Represented
California	0	0	0	0	0	0	4	0	0	....
Colorado	0	0	0	0	0	0	1	1	0	0
Connecticut	19	12	1	6	3	1	5	1	60.0	100.0
Delaware	5	0	4	1	1	3	2	3	50.0	100.0
Iowa	2	0	2	0	0	1	2	1	0	100.0
Illinois	41	16	18	7	9	9	15	9	60.0	100.0
Indiana	1	1	0	0	1	0	3	0	33.3	....
Kentucky	1	1	0	0	2	0	9	0	22.2	....
Maryland	3	2	1	0	1	1	1	1	100.0	100.0
Massachusetts	17	5	0	12	2	0	5	0	40.0	....
Michigan	0	0	0	0	0	0	1	0	0	....
Minnesota	2	2	0	0	2	0	5	1	40.0	0
Missouri	5	3	1	1	1	1	4	1	25.0	100.0
Nebraska	0	0	0	0	0	0	1	0	0	....
New Jersey.....	21	12	3	6	7	1	9	2	77.8	50.0
New York.....	69	28	20	21	15	6	19	9	78.9	66.6
North Carolina.....	1	0	0	1	0	0	4	0	0	....
Oklahoma	0	0	0	0	0	0	2	0	0	....
Oregon	0	0	0	0	0	0	0	1	....	0
Ohio	63	32	20	11	13	11	23	20	56.5	55.0
Pennsylvania	37	15	19	3	6	11	16	17	37.5	64.7
Rhode Island.....	7	5	0	2	1	0	1	0	100.0	....
South Carolina	0	0	0	0	0	0	4	0	0	....
South Dakota.....	4	1	0	3	0	0	1	0	0	....
Tennessee	2	2	0	0	2	0	5	0	40.0	....
Texas	4	3	0	1	3	0	6	0	50.0	....
Virginia	1	1	0	0	1	0	7	0	14.3	....
Washington, D. C.....	3	2	0	1	..	..	..	..	..	....
West Virginia.....	2	2	0	0	1	0	1	0	100.0	....
Wisconsin	14	4	8	2	0	5	7	6	0	83.4
No State given.....	1	0	0	1	0	0	0	0	..	....
Canada	60	12	22	26	6	5	8	5	75.0	100.0
Totals.....	385	161	119	105	77	55	171	78	45.0	70.5

The National Safety Competition



Sentinels of Safety—The Explosives Engineers Trophy

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The following officers were elected for the year 1926:

President, A. G. Seitz, Rock Cut Stone Co., Syracuse.

Vice-President, F. E. Conley, F. E. Conley Stone Co., Utica.

Secretary and Treasurer, Geo. E. Schaefer, General Crushed Stone Co., Rochester.

The balance of the meeting was devoted to miscellaneous business including a hot discussion on power costs.

The meeting adjourned subject to call of the Chair.

Today much is being done by mine and quarry operators, as well as state and national organizations, to reduce the number of accidents which yearly occur in those respective industries.

The Explosives Engineer, as their contribution towards the minimizing of accidents, has established an annual National Safety Competition and will award to the winner the Explosives Engineer Trophy, "Sentinels of Safety." This trophy, which was designed by the well-known sculptor, Begni del Piatti, portrays in bronze a mother and child greeting the father upon his safe return from work. Three bronze replicas of "Sentinels of Safety" will be made: one for coal mining, one for metal mining, and one for quarrying and open-pit mining. The winning company in each of these explosive consuming industries may, besides holding the original bronze for one year, afterwards secure and erect permanently on its property a large out-of-doors marble replica of the trophy. In addition to the trophy itself, awarded to the company, each employee will also receive an individual certificate of honor.

The United States Bureau of Mines has given their hearty endorsement and cooperation to the National Safety Competition.

The National Crushed Stone Association at its ninth annual convention recently held in Montreal passed the following resolution:

"WHEREAS for humanitarian and economic reasons, safety is a consideration of primary importance to quarry operators, and

"WHEREAS the National Safety Council by organizing a Quarry Section, and the United States Bureau of Mines, by providing a separate statistical service for the quarrying industry in a National Safety Competition, have already demonstrated their desire and ability to assist producers of crushed stone in promoting safety.

"THEREFORE, BE IT RESOLVED: That the National Crushed Stone Association in Convention assembled heartily endorses the activities of the Quarry Section of the National Safety Council and the National Safety Competition conducted under the auspices of the United States Bureau of Mines, and

"BE IT FURTHER RESOLVED: That the National Crushed Stone Association recommends to all of its members that they participate in these two worthy movements."

The letter on opposite page is published through the courtesy of The Explosives Engineer:

DEPARTMENT OF COMMERCE
BUREAU OF MINES
WASHINGTON
Office of the Director

Why every eligible Mine and Quarry should enter the National Safety Competition

Safety in the mineral industries is one of the chief subjects of the investigations conducted by the Bureau of Mines. Competition promotes progress in mine safety through keeping alive interest in accident prevention among workers and employers. It is because of this fact, as well as the fact that the Bureau's safety studies will be facilitated, that the Bureau of Mines is interested in the contest for the bronze trophy, "Sentinels of Safety," which is to be awarded by The Explosives Engineer to the coal mine, the metal mine, and the quarry or open-pit mine having the smallest loss of time from accidents in proportion to total time worked, each year.

Nearly 300 mines and quarries were entered in the 1925 contest. The companies' accident reports are now being studied and the successful competitors will be announced as soon as possible after the close of the year. The formal presentation of the trophies will take place at the Bureau's annual First Aid and Rescue Meet in the autumn of 1926.

Because of the direct and indirect benefits to be derived from the contest, it is desirable that all companies that are eligible, consider competing for the second annual award which will be based on the contestants' safety record during the calendar year 1926.

(Signed) D. A. LYON, Acting Director
For SCOTT TURNER, Director

(Note: Complete information and rules governing the National Safety Competition will be mailed to you upon request.)

ENTRY APPLICATION

Director, Bureau of Mines,
Department of the Interior,
Washington, D. C.

Dear Sir:

This company desires to enter the National Safety Competition under the auspices of the United States Bureau of Mines. A complete record of each accident in 1925 disabling an employee longer than the remainder of the day of accident will be forwarded to your office. Each report will show the number of calendar days of disability of the injured employee. At the close of each month the number of employees and time worked will be reported. The number of men regularly employed is approximately.....men underground in the mine, or.....men in the quarry pit or open-pit mine. The identity of the property for which accident reports will be furnished is indicated below.

Name

Company Position

Name of mine or quarry.....Kind of mineral or stone.....

Location: State..... County..... P. O.

(Note: Carbon copies of regular forms prescribed by the Compensation Commission of your state may be used in furnishing the accident data required for the contest; or, if you desire, the Bureau will furnish suitable forms: Director, Bureau of Mines.

(Continued from Page 1)

in Canada, the ever present possibility of a raid flashed into our minds. Of course, the next step was to locate the manager and arrange for the necessary police protection. He informed us with considerable dignity that our fears were groundless, as it was not necessary to conduct raids in Canada. Seeing that we were still somewhat mystified he further elucidated that the blasts which had given us so much concern were undoubtedly merely the preliminary tuning up of the Highland Laddie Bagpipe Band, which had been engaged for the purpose of opening the Manufacturers' Division Exposition.

Edging over toward the center of activities we beheld a most unusual sight. Directly behind the Highland Laddie Bagpipe Band, Mr. Rockwood and Mr. Boyd were endeavoring to line up the various members of the Manufacturers' Division preparatory to a parade around the lobby of the Hotel. This was soon successfully accomplished and with the Bagpipers bagpiping full blast the lobby was circled three times and the walls still remained standing. Realizing that the time of miracles was past, the parade headed for the Exposition room where one more futile attempt was made to raze the walls whereupon the Manufacturers' Division Exposition was formally declared open. After viewing one of the most comprehensive exhibits of quarry equipment and machinery ever staged by the Manufacturers' Division, we fell in behind the Band which had suddenly started bagpiping again and went up to the top floor where the smoker was to be held. Here in a very attractive room fashioned after a quaint old Italian Village, much in the way of novel entertainment was provided, including exhibitions of the Charleston, sketches from an Italian Carnival Street Scene and two fast boxing bouts. During the course of the entertainment refreshments were served which contributed largely to the pleasure of the evening.

The Honorable J. L. Perron, K. C. Minister of Roads, Province of Quebec, was unexpectedly called out of town at the last minute to attend a meeting of the Cabinet and consequently was prevented from giving the opening address on Tuesday morning. President Graves asked Major Acheson and Mr. Smith, both of the New York State Department of Public Works, to favor us with a few impromptu remarks. This, they very graciously consented to do.

Mr. Hubbard next gave a paper in which he presented some very interesting statistics showing that the National Crushed Stone Association and the Asphalt Association had much in common and could advantageously work in cooperation with one another.

The paper on "Kentucky Rock Asphalt," given by Mr. Hutchinson, was both interesting and instructive, and showed Mr. Hutchinson to be thoroughly familiar with his subject.

Owing to the controversy going on at the present time relative to the proposed increase in freight rates on crushed stone, we were particularly glad of the opportunity of hearing Mr. Neagle's paper on "The Transpor-

tation Business." Mr. Neagle clearly demonstrated that the economic health of the country is dependent to a considerable extent on our railroads being able to operate on a profitable basis.

The matter of Safety is a subject which vitally concerns all those engaged in the production of crushed stone and it was, therefore, with a very real interest that we heard Mr. Evans describe the work of the Quarry Section of the National Safety Council.

Mr. Souder contributed a very valuable paper to our Proceedings on the subject of "The Fire Hazard of Quarry Plants and How to Carry It," and the excellent discussion which followed showed the keen interest which everyone has in this subject.

The session on Tuesday afternoon was devoted to Superintendents and Operating Men. The meeting was opened in the small convention room which was soon filled to overflowing, necessitating adjournment to the main convention hall. This large attendance was very gratifying and demonstrated the advisability of devoting at least one of our sessions to Superintendents and Operating Men.

Mr. Mack, in dealing with the subject of "The Human Element in Plant Operation," laid stress upon the fact that the three cardinal principles necessary for a solution of problems involving the Human Element are, Confidence, Justice and Truth, and that one important means for maintaining these principles is by the establishment and operation of the seniority rule.

Mr. Scott has established for himself the enviable reputation of having one of the most tidy plants in the Industry and therefore we welcomed the opportunity of hearing him discuss "The Advantages of a Tidy Plant." This he did in a jocular and exceedingly interesting way.

The experiments with liquid oxygen performed by Mr. Van Alstyne in connection with the paper "Oxygen, the Wonder Worker," given by Mr. Rogers, were unique and spectacular. A number of articles, including a rose and some cranberries when dipped in the liquid oxygen almost instantaneously became frozen solid and when dropped to the floor shattered into a thousand pieces. An egg was broken into a pan containing the oxygen and after a few seconds when held up for inspection appeared to be a very delectable morsel. When Mr. Van Alstyne shook the pan it was plainly evident that the digestive apparatus of even the most modern stone crusher would be taxed to the limit.

Due to the inability of Mr. Gaby to be present, Mr. Trimble gave the paper on "Rock Excavation on the Hydro Electric Canal." He supplemented the paper with a series of slides dealing with the various phases of the work. It is interesting to note that the total rock excavated from the forebay and canal was in excess of 4,700,000 cubic yards.

On Tuesday evening practically the entire convention turned out to see the professional ice hockey game played between the Ottawas and the Canadiens. The game was

fast and furious and provided the spectators with many thrills. It seems that the lot of a hockey game umpire is about as dangerous as that of our baseball umpires as towards the close of the game one of the overenthusiastic rooters took exception to a decision and heaved a beer bottle at the umpire's head. Fortunately he registered a miss, so after the broken glass had been removed from the rink, the game proceeded to an uninterrupted conclusion.

The Wednesday morning session was largely devoted to the subject of railway ballast. Mr. F. J. Stimson, Assistant Chief Engineer, Maintenance of Way for the Pennsylvania Railroad, opened the session with his paper entitled "Railway Ballast." This was followed with a comprehensive discussion contributed by Mr. MacKenzie, Engineer, Maintenance of Way, Canadian Pacific Railway Company, Mr. Blaiklock, Assistant Chief Engineer, Canadian National Railways, and Mr. Neubert, Engineer, Maintenance of Way, New York Central Railroad.

The report of the Committee on Standards, presented by the Chairman, Col. O. P. Chamberlain, gave evidence that a vast amount of work had been performed by this committee and Col. Chamberlain and his associates deserve the highest praise for their efforts in this direction.

The report of the Membership Committee, submitted by Col. Tyler, showed the vigorous growth of the Association during the past year, due in large part to the efforts of this Committee.

Mr. Rice, Chairman of the Committee on Ballast, presented information obtained in answer to a questionnaire submitted to every railroad in the United States. Answers were received from 50 railroads representing a mileage of approximately 110,000 miles. Mr. Rice's full report will be carried in a subsequent issue of the Journal and deserves careful reading by everyone.

Mr. Everett, Commissioner and State Engineer of New Hampshire, gave an interesting and detailed account of highway construction in New Hampshire with particular reference to the part played by crushed stone.

The concluding paper at the morning session was an address by S. L. Squire, Deputy Minister, Department of Public Highways, Toronto.

The afternoon session on Wednesday was devoted to salesmen with Mr. Brandon of the Ohio Marble Company in the Chair. Mr. Brandon opened the meeting with a short talk on the organization of the Sales Group, after which he introduced Mr. Murphy of the Brownell Improvement Company. Mr. Murphy laid emphasis on the fact that salesmen should not stop with the selling of stone but should include with this the giving of service. Mr. Rarey of the Marble Cliff Quarries Company presented a paper describing how the secondary road problem is being handled in Ohio. He was followed by Mr. Schaefer and Mr. Reinhold who discussed this subject from the point of view of New York and Pennsylvania, respectively.

Mr. Wortman in his paper on "Competition of Aggregates," discussed the various difficulties encountered by the stone men in meeting competition of competing aggregates and stressed the desirability of bringing about an equitable differential between the various aggregates.

Mr. Goldbeck in his paper brought out the many ways in which the Bureau of Engineering can be of assistance to salesmen. Mr. Boyd outlined the possibilities of developing the Crushed Stone Journal along lines which would make it of more value to salesmen.

The Ninth Annual Banquet of the Association held on Wednesday evening was one of the most enjoyable events of the Convention. Regional Vice-President C. M. Doolittle was Toastmaster and Sir Henry Thornton, K. B. E. President of the Canadian National Railways, was the guest of honor. Other notable speakers of the evening included John A. Macdonald, Highway Commissioner of the State of Connecticut; Charles M. Upham, State Highway Engineer of the North Carolina State Highway Commission and Director of the Highway Research Board, National Research Council, and Cornelius D. Garretson, Member, Business Methods Committee, Rotary International.

Undoubtedly the most inspiring moments of the Convention took place when Mr. Murphy announced that President Graves was to be continued in office for another year. With one accord the entire assembly rose and applauded for several minutes. The demonstration was spontaneous and sincere and showed the depth of the affection and gratitude in which all members, active and associate, American and Canadian, of the National Crushed Stone Association hold Mr. Graves. It was a tribute to the continued and untiring effort which he, as President, has put forth in furthering the interests of our Association during the past year.

Just before the close of the Banquet, Mr. Garber, the newly elected Chairman of the Manufacturers' Division, presented Mr. Rockwood, in recognition of his long and faithful service as Secretary-Treasurer of the Division, a beautiful watch and chain. Mr. Rockwood, in accepting, asked Mr. Garber to extend to the Manufacturers' Division his sincere thanks and deep appreciation of their thoughtfulness and generosity in presenting him with such a beautiful gift.

One of the most interesting papers of the entire convention was given by Dr. F. E. Baer, Director of Soils Department, Ohio State University, on the subject of "Limestone for Plants, Animals, and Man." Dr. Baer handled his subject in a pleasing and entertaining manner.

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The report of the Railroad Committee presented by the Chairman, Mr. Sporborg, summarized the decisions rendered in the case of Docket 15,329. President Graves called upon Mr. Sanborn to tell us what occurred in Kansas City at the recent hearing of the case known as ex parte 87 and what the present situation is. Mr. Sanborn favored us with an excellent summary of the Kansas City proceedings and stated that a proper presentation of our case was seriously handicapped due to a lack of definite statistical information. He expressed his opinion that the Association should obtain this information and that the membership should cooperate to the fullest extent in sending it in.

President Graves introduced to the Convention, Mr. Van Voorhis, the new engineer of the Ohio Crushed Stone Association. Mr. Van Voorhis expressed his pleasure at being able to meet with us and stressed the desirability of the producers getting in closer contact with their engineers.

After receiving the reports of the Committees on Resolutions and Nominations, the Officers for 1926 were installed as follows:

Otho M. Graves, President
James Savage, Treasurer
J. R. Boyd, Secretary

Regional Vice-Presidents

A. R. Wilson—Western	Thomas McCroskey—Southern
G. J. Whelan—Central	W. R. Sanborn—Northern
Stirling Tomkins—Eastern	C. M. Doolittle—Canadian

Board of Directors

O. M. Graves, Chairman, Easton, Pa.	B. D. Pierce, Jr., Bridgeport, Conn.
H. E. Bair, Toledo, Ohio.	John Rice, Easton, Pa.
A. J. Blair, Milwaukee, Wis.	W. R. Sanborn, Kankakee, Ill.
W. W. Loxley, Roanoke, Va.	James Savage, Buffalo, N. Y.
Harry Brandon, Piqua, Ohio.	F. W. Schmidt, Morristown, N. J.
L. R. Cartwright, Indianapolis, Ind.	J. F. Schroeder, Davenport, Iowa.
O. P. Chamberlain, Chicago, Ill.	J. J. Sloan, Chicago, Ill.
E. C. Dodson, Dallas, Texas.	W. L. Sporborg, Syracuse, N. Y.
C. M. Doolittle, Hamilton, Ontario, Canada.	Stirling Tomkins, Tomkins Cove, N. Y.
W. Scott Eames, New Haven, Conn.	R. B. Tyler, Louisville, Ky.
F. T. Gucker, Philadelphia, Pa.	G. J. Whelan, Cleveland, Ohio.
W. H. Hoagland, Columbus, Ohio.	A. R. Wilson, Watsonville, Calif.
F. R. Kanengeiser, Pittsburgh, Pa.	W. F. Wise, San Antonio, Texas.
J. C. King, Youngstown, Ohio.	John Wunder, Minneapolis, Minn.
E. J. Krause, St. Louis, Mo.	M. B. Garber, Orrville, Ohio.
Thomas McCroskey, Knoxville, Tenn.	N. S. Greensfelder, Wilmington, Del.
F. C. Murphy, Chicago, Ill.	S. R. Russell, Wilmington, Del.
Stuvvesant Peabody, Chicago, Ill.	

The Ninth Annual Convention of the National Crushed Stone Association was then declared adjourned.

MANUFACTURERS' DIVISION ELECTS OFFICERS FOR 1926

At a meeting of the Manufacturers' Division held during the Montreal Convention, the following officers were elected for the year 1926:

Chairman

M. B. Garber,
Sanderson-Cyclone Drill Co.,
Orrville, Ohio.

Directors on the Board of the National Crushed Stone Association

M. B. Garber
S. R. Russell
N. S. Greensfelder

Vice-Chairmen

L. W. Shugg, General Electric Co., Schenectady, N. Y.	Arthur F. King, Marion Steam Shovel Co., Marion, Ohio.
Thos. Robins, Jr., Robins Conveying Belt Co., New York, N. Y.	R. Grubb, Canadian Explosives, Ltd., Montreal, Canada.
Gordon Buchanan, C. G. Buchanan Co., New York, N. Y.	A. E. Holcomb, The Koehring Co., Milwaukee, Wis.

Secretary

J. R. Boyd,
751 Earle Bldg.,
Washington, D. C.

ADDITIONAL DIRECTORS ELECTED

(All of the Members Mentioned Are Directors)

Fred A. Gill, Gill Rock Drill Co., Lebanon, Penna.	C. B. Andrews, Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
S. B. Belden, Jeffrey Manufacturing Co., Columbus, Ohio.	Geo. G. Armstrong, Armstrong Manufacturing Co., Waterloo, Iowa.
John M. Johnson, Allis-Chalmers Mfg. Co., Milwaukee, Wis.	E. G. Lewis, Bucyrus Company, Milwaukee, Wis.
B. G. Shotton, Hendrick Manufacturing Co., Carbondale, Penna.	H. R. Sykes, Fate-Root-Heath Co., Plymouth, Ohio.

Mr. N. C. Rockwood, who in the past has served the N. C. S. A. so long and so well as Secretary-Treasurer of the Manufacturers' Division, was obliged to decline to serve in this connection for the coming year. Mr. J. R. Boyd, Secretary of the National Crushed Stone Association, took over the duties of the office formerly held by Mr. Rockwood.

NEW MEMBERS

The following firms have become members of the N. C. S. A. since the publication of Journal No. 112:

Active

- 2 Albany Crushed Stone Co., Albany, N. Y.
- 2 Harry T. Campbell Sons, Inc., Towson, Md.
- 3 Chico Crushed Stone Co., Dallas, Texas.
- 1 E. B. Johnson, Adams & Duford Co., Chaumont, N. Y.
- 2 Mid-West Crushed Stone Co., Indianapolis, Indiana.
- 1 Montreal Crushed Stone Co., Montreal, Canada.
- 2 Saluda Crushed Stone Co., Greenville, South Carolina.
- 1 Southern Crushed Stone and Granite Co., Trenton, S. C.
- 2 Texas Trap Rock Co., San Antonio, Texas.
- 1 J. D. Sargent, Mt. Airy, North Carolina.
- 2 Lawrence Stone and Gravel Co., Raleigh, North Carolina.
- 1 Spartanburg Quarries Corp., Spartanburg, S. C.

Associate

- Blaw-Knox Company, Pittsburgh, Penna.
- The Barrett Company, New York City.
- The Burrell Engineering & Construction Co., Chicago, Ill.
- The Koppell Industrial Car & Equipment Co., Koppel, Penna.
- Lubriko Company, Philadelphia, Penna.
- Ohio Locomotive Crane Co., Bucyrus, Ohio.
- The Spencer Construction Co., Eastern-Division Macdonald Engineering Company, Baltimore, Md.

Increases in Memberships

- 2-4 Interstate Crushed Stone Co., Springfield, N. J.
- 1-2 Old Colony Crushed Stone Co., Quincy, Mass.
- 2-4 Texas Stone Products Co., Dallas, Texas.
- 1-2 John T. Kilcourse, 70 Belknap St., Lawrence, Mass.

ACTIVE MEMBERS IN THE NATIONAL CRUSHED STONE ASSOCIATION

No

Memberships

- 2 Acme Limestone Co., Alderson, W. Va.
- 2 Albany Crushed Stone Co., 55 State St., Albany, N. Y.
- 1 American Crushed Rock Co., Ostrander, Ohio.
- 2 American Lime and Stone Co., Bellefonte, Pa.
- 1 American Stone Ballast Co., High Bridge, Ky.
- 1 Anna Stone Company, Anna, Ill.
- 2 Ashland Limestone Co., 408 Ashland National Bank Bldg., Ashland, Ky.
- 2 The Edward Balf Company, 14 Haynes St., Hartford, Conn.
- 1 Beachville White Lime Co., Beachville, Ont., Canada.
- 1 C. C. Beam, Melvin, Ohio.
- 1 Belmont-Gurnee Stone Co., North Bergen, N. J.
- 10 Bessemer Limestone & Cement Co., 714 Stambaugh Bldg., Youngstown, Ohio.
- 1 O. H. Binns, Logansport, Ind.
- 2 Blake Brothers Co., 204 Balboa Bldg., San Francisco, Calif.

- 2 Blue Ridge Stone Co., Roanoke, Va.
- 5 Bluffton-Lewisburg Stone Co., Findlay, Ohio.
- 2 Boggs, Burnam & Co., Richmond, Ky.
- 4 Bound Brook Crushed Stone Co., Bound Brook, N. J.
- 1 Britton Crushed Stone Corp., 717 Commerce Bldg., Rochester, N. Y.
- 6 Brownell Improvement Co., 1220 Chamber of Commerce Bldg., Chicago, Ill.
- 6 Buffalo Cement Co., 110 Franklin St., Buffalo, N. Y.
- 8 Buffalo Crushed Stone Co., 1048 Ellicott Square, Buffalo, N. Y.
- 2 Callanan Road Improvement Co., P. O. Box 773, Albany, N. Y.
- 2 Harry T. Campbell Sons Co., Inc., Towson, Md.
- 4 Canada Crushed Stone Corporation, Hamilton, Ont., Canada.
- 5 Carbon Limestone Co., 814 Stambaugh Bldg., Youngstown, Ohio.
- 1 Carthage Crushed Limestone Co., P. O. Box 409, Carthage, Mo.
- 4 Casparis Stone Co., 302 Yuster Bldg., Columbus, Ohio.
- 1 The Casper Stolle Quarry & Contracting Co., 503 First National Bank Bldg., East St. Louis, Ill.
- 1 Cerulean Stone Co., Cerulean, Ky.
- 2 Chickamauga Quarry & Const. Co., 1st Nat'l Bank Bldg., Chattanooga, Tenn.
- 3 Chico Crushed Stone Co., 903 Insurance Bldg., Dallas, Tex.
- 1 Clarke Rock & Gravel Corp., 3326 San Fernando Rd., Los Angeles, Calif.
- 1 The Collins Granite Co., Inc., R. F. D. No. 4, Danville, Va.
- 6 Columbia Quarry Co., 910 Century Bldg., St. Louis, Mo.
- 2 Commonwealth Quarry Co., Summit, N. J.
- 2 The F. E. Conley Stone Co., 253 Union Station, Utica, N. Y.
- 10 Connecticut Quarries Co., New Haven, Conn.
- 2 Consolidated Stone & Sand Co., Clare Road, Montclair Heights, Essex County, N. J.
- 3 Consumers Company, 111 W. Washington St., Chicago, Ill.
- 2 Cushing Stone Co., Inc., 437 State St., Schenectady, N. Y.
- 2 Davis Bros. Stone Co., Lannon, Wis.
- 2 Delaware-River Quarry & Construction Co., 21 Bridge St., Lambertville, N. J.
- 4 Dittlinger Lime Co., New Braunfels, Tex.
- 1 Dolese Bros. Co., 337 West Madison St., Chicago, Ill.
- 2 Dolese & Shepard, 108 South LaSalle St., Chicago, Ill.
- 2 Dolomite Products Co., 124 E. & B. Bldg., Rochester, N. Y.
- 2 Duluth Crushed Stone Co., 1506 Alworth Bldg., Duluth, Minn.
- 4 John T. Dyer Quarry Co., Harrison Block, Philadelphia, Pa.
- 1 Eagle Point Lime Works, Dubuque, Iowa.
- 1 East St. Louis Stone Co., 255 Arcade Bldg., East St. Louis, Ill.
- 4 Elmhurst-Chicago Stone Co., Elmhurst, Ill.
- 1 Fay Quarries, 101 Union St., New Bedford, Mass.
- 1 Federal Stone Co., 133 West Washington St., Chicago, Ill.
- 11 France Stone Co., 1800 2nd National Bank Bldg., Toledo, Ohio.
- 3 Franklin Limestone Co., 612 10th Ave. N., Nashville, Tenn.
- 12 General Crushed Stone Co., Drake Bldg., Easton, Pa.
- 2 Genesee Stone Products Co., Batavia, N. Y.
- 2 Gopher Stone Co., 1500 Johnson St., N. E., Minneapolis, Minn.

- 1 Gordon Crushed Stone Co., 18 Toronto St., Toronto, Canada.
- 4 Granite Rock Co., Box M, Watsonville, Calif.
- 2 Great Notch Corporation, 20 Washington Place, Newark, N. J.
- 2 Greenville Stone & Gravel Co., 269 Walnut St., Memphis, Tenn.
- 1 Grove City Limestone Co., Sharon, Pa.
- 2 Hagersville Contracting Co., Ltd., Hagersville, Ontario, Canada.
- 3 Hagersville Quarries, Ltd., 4 Flora St., St. Thomas, Ont., Canada.
- 2 Harris Granite Quarries Co., Salisbury, N. C.
- 4 Edward Hely Stone Co., Cape Girardeau, Mo.
- 1 Holston Quarry Co., Robbins Bldg., Box 292, Knoxville, Tenn.
- 2 T. C. Hubbert & Co., Inc., 707 S. Broome St., Wilmington, Del.
- 1 Hughes Stone Co., 808 Mayo Bldg., Tulsa, Okla.
- 1 Chas. O. Hunsicker, Hunsicker Bldg., Allentown, Pa.
- 4 Interstate Crushed Stone Co., P. O. Box 129, Springfield, N. J.
- 1 Johnson, E. B., Adams & Duford Co., Chaumont, N. Y.
- 10 Kelley Island Lime & Transport Co., 1125 Leader-News Bldg., Cleveland, Ohio.
- 3 Kentucky River Stone & Sand Co., Lawrenceburg, Ky.
- 1 Kentucky Rock Asphalt Co., Marion E. Taylor Bldg., Louisville, Ky.
- 2 Keystone Trappe Rock Co., Glenmore, Pa.
- 2 John T. Kilcourse, 70 Belknap St., Lawrence, Mass.
- 2 Kittanning Limestone Co., Safe Deposit Bldg., Kittanning, Pa.
- 3 Lake Erie Limestone Co., 901 Wick Bldg., Youngstown, Ohio.
- 2 Lake Shore Stone Co., 600 Canal St., Milwaukee, Wis.
- 2 Lambertville Stone Quarry Co., Colonial Trust Bldg., Philadelphia, Pa.
- 1 Landa Rock Products Co., New Braunfels, Tex.
- 4 John S. Lane & Son, Inc., Meriden, Conn.
- 2 Lawrence Stone & Gravel Co., 516 Commercial Bank Bldg., Raleigh, N. C.
- 4 Lehigh Stone Co., Kankakee, Ill.
- 3 LeRoy Lime & Crushed Stone Corp., LeRoy, N. Y.
- 2 Liberty Lime & Stone Co., Rocky Point, Va.
- 2 Ligonier Stone Products Co., Blairsville, Pa.
- 4 Linwood Cement Co, 714 Kahl Bldg., Davenport, Iowa.
- 1 L. & M. Stone Co., Mayro Bldg., Utica, N. Y.
- 5 Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
- 1 Lutz Stone Company, Oshkosh, Wis.
- 10 Marble Cliff Quarries Co., 907 Hartman Bldg., Columbus, Ohio.
- 1 Mayville White Lime Co., Mayville, Wis.
- 5 Thos. McCroskey, Box 262, Knoxville, Tenn.
- 2 Joseph McCormick, 319 Tannton Ave., East Providence, R. I.
- 1 W. E. McNasser, Solvay Process Co., Syracuse, N. Y.
- 2 Mid-West Crushed Stone Co., 514 Traction Terminal Bldg., Indianapolis, Ind.
- 2 Mississippi Lime and Material Co., 201 W. 3rd St., Alton, Ill.
- 1 Molder Bros., 810 Wilson St., Findlay, Ohio.
- 5 Monon Crushed Stone Co., Box 366, Monon, Ind.
- 1 Montreal Crushed Stone Co., 590 Union Ave., Montreal, Canada.
- 4 Morris County Crushed Stone Co., 17 South St., Merristown, N. J.
- 5 T. K. Morris Lime & Limestone Co., 2215 Oliver Bldg., Pittsburgh, Pa.
- 1 T. A. Morrison & Co., Ltd., 1070 Bleury St., Montreal, Canada.
- 1 National Lime & Stone Co., Carey, Ohio.
- 1 National Quarries Co., Carey, Ohio.
- 2 National Stone Company, Box 832, Joliet, Ill.
- 2 New Castle Lime & Stone Co., 500 Greer Bldg., New Castle, Pa.
- 10 New Haven Trap Rock Co., 67 Church St., New Haven, Conn.
- 1 Northwestern Quarry Co., Rapid City, S. D.
- 2 Norton Stone & Lime Corp., Arkay Bldg., Albany, N. Y.
- 5 The Ohio Marble Co., Piqua, Ohio.
- 2 Old Colony Crushed Stone Co., Quincy, Mass.
- 2 Peerless Quarries, Inc., 404 Court St., Utica, N. Y.
- 2 Pembroke Limestone Corporation, Pembroke, Va.
- 1 A. Petrillo Co., 5 Edgemore Road, Wilmington, Del.
- 2 Pounding Mill Quarry, Pounding Mill, Va.
- 1 Edmund Putnam, Box 852, Pittsfield, Mass.
- 2 Quartzite Quarries, Inc., Luverne, Minn.
- 2 Raleigh Granite Co., Raleigh, N. C.
- 1 Reinhold & Co., Inc., 1422 Oliver Bldg., Pittsburgh, Pa.
- 12 Rock Cut Stone Co., 531 Union Bldg., Syracuse, N. Y.
- 1 Tayloe Rogers, Radford Limestone Corp., 1st Nat'l Bank Bldg., Roanoke, Va.
- 1 Rowe Contracting Co., Malden, Mass.
- 2 Saluda Crushed Stone Co., 214 Capers Bldg., Greenville, S. C.
- 1 J. D. Sargent, Mt. Airy, N. C.
- 2 Schumacher Stone Co., Pandora, Ohio.
- 2 Leatham D. Smith Stone Co., Sturgeon Bay, Wis.
- 1 Southern Crushed Stone & Granite Co., R. F. D., Trenton, S. C.
- 1 Spartanburg Quarries Corp., 139½ E. Main St., Spartanburg, S. C.
- 2 T. W. Spinks Co., Covington, Ky.
- 2 Stringtown Crushed Rock Co., McAlester, Okla.
- 1 Thomas Sullivan, 1042 Omaha Nat'l Bank Bldg., Omaha, Nebr.
- 1 Superior Stone Co., 5 N. La Salle St., Chicago, Ill.
- 1 The Supply Distributors Corp., Marion Bldg., Cleveland, Ohio.
- 2 Susquehanna Stone Co., 1007 Franklin St., Williamsport, Pa.
- 1 The Tarbox-McCall Stone Co., 852 Western Ave., Findlay, Ohio.
- 2 Templeton Limestone Co., Kittanning, Pa.
- 4 Texas Stone Products Co., Insurance Bldg., Dallas, Tex.
- 2 Texas Trap Rock Co., 610 Maverick Bldg., San Antonio, Tex.
- 1 Thomas & Frankenberry, Canon City, Colo.
- 2 Thurber Earthen Products Co., 1701 F. & M. Bank Bldg., P. O. Box 1868, Ft. Worth, Tex.
- 1 The Toledo Stone & Glass Sand Co., R. R., Sylvania, Ohio.
- 10 Tomkins Cove Co., Tomkins Cove, N. Y.
- 5 R. B. Tyler Co., 114 Fourth St., Louisville, Ky.
- 2 Trap Rock Company, Minneapolis, Minn.
- 2 Union Rock Co., 1403 East 16th St., Los Angeles, Calif.
- 2 Universal Granite Quarries Co., 133 W. Washington St., Chicago, Ill.

- 2 F. R. Upton, Inc., 821 Union Bldg., Newark, N. J.
- 2 Van Camp Stone Co., 12 E. 6th St., Cincinnati, Ohio.
- 1 Virginia Limestone Corp., 505 Mt. Trust Bldg., Roanoke, Va.
- 4 Wagner Quarries Co., Schmidt Bldg., Sandusky, Ohio.
- 7 Wallace Stone Co., Bay Port, Mich.
- 2 Waterstreet Trap Rock Co., Water Street, Pa.
- 2 Waukesha Lime & Stone Co., Waukesha, Wis.
- 1 Welden Springs Quarry Co., Inc., Welden Springs, Mo.
- 1 Wentworth Quarries, Ltd., Vinemount, P. O., Ontario, Canada.
- 2 Western Lime & Cement Co., Milwaukee, Wis.
- 4 The Weston & Brooker Co., Columbia, S. C.
- 1 Whitehouse Stone Co., Spitzer Bldg., Toledo, Ohio.
- 2 Wickwire Spencer Steel Corp., Station B, Buffalo, N. Y.
- 2 Wing & Evans, 40 Rector St., New York, N. Y.
- 2 Winston & Co., Inc., Masonic Bldg., Harrisburg, Pa.
- 5 Wisconsin Granite Co., 105 W. Monroe St., Chicago, Ill.
- 1 Wood County Stone & Const. Co., Bowling Green, Ohio.
- 4 Woodville Lime Products Co., 622 Madison Ave., Toledo, Ohio.
- 2 John Wunder Co., Broadway and K Sts., Minneapolis, Minn.
- 2 York Hill Trap Rock Quarry Co., 98 State St., Meriden, Conn.

Associate Members of the National Crushed Stone Association

- Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Crushing Plants and Machinery.
- American Hoist and Derrick Co., St. Paul, Minn.
Hoists, Derricks and Locomotive Cranes.
- American Manganese Steel Co., Chicago Heights, Ill.
"Amsco" Manganese Steel Castings.
- Armstrong Manufacturing Co., Waterloo, Iowa.
Blast Hole Drills, Bit Dressing Machines.
- Atlas Powder Co., Wilmington, Del.
Explosives and Blasting Accessories.
- Austin Mfg. Company, 400 N. Michigan Ave., Chicago, Ill.
Rock Crushing Machinery.
- Earle C. Bacon, Inc., 26 Cortlandt St., New York City.
Complete Plants, Crushers, Elevators, Screens, Conveyors.
- The Barrett Company, 40 Rector St., New York City.
Tarvia for Road Construction, Repair and Maintenance.
- Blaw-Knox Co., P. O. Box 915, Pittsburgh, Pa.
Manufacturers of Steel Products.
- The Browning Crane Co., 16226 Waterloo Rd. N. E., Cleveland, Ohio.
Locomotive Cranes.
- C. G. Buchanan Co., Inc., 90 West St., New York City.
Crushers, Crushing Rolls, Magnetic Separators.
- The Bucyrus Company, South Milwaukee, Wis.
Steam, Electric, "Diesel and Gas Shovel," Dredges.
- Buffalo Wire Works, 521 Terrace, Buffalo, N. Y.
Wire Cloth and Screens.
- Burrell Engineering & Construction Co., 513 West Jackson Blvd., Chicago, Ill.
Design and Construction.
- Canadian Explosives, Limited, Canada Cement Bldg., Montreal, Can.
Explosives and Blasting Supplies.

- Canadian Westinghouse, Ltd., Hamilton, Ontario, Canada.
Cranes, Motors, etc.
- The Carroll Chain Co., 265 Hosack St., Columbus, Ohio.
"Carroll" Solid Weld Steam Shovel Hoisting Chains.
- Cement Mill and Quarry, 542 Monadnock Block, Chicago, Ill.
"Publishers."
- Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
Conveyor and Transmission Belting, Suction Hose, Dredging Sleeves.
- The Columbus McKinnon Chain Co., 5th and Merrith Sts., Columbus, Ohio.
Hercules Solid Weld Steam Shovel Chain.
- Denver Rock Drill Mfg. Co., 30 Church St., New York City.
Rock Drills and Mining Accessories.
- The R. & J. Dick Co., Passaic, N. J.
"Dickbelt," for Transmission, Elevating and Conveying.
- E. I. du Pont de Nemours & Co., Wilmington, Del.
"Explosives of All Kinds and Blasting Accessories."
- Easton Car and Construction Co., Easton, Pa.
Quarry Cars.
- Ensign-Bickford Co., Simsbury, Conn.
Safety Fuse and Cordeau Bickford Detonating Fuse.
- Fairbanks, Morse & Co., 347 W. 4th St., Cincinnati, Ohio.
Diesel Engines, Electric Motors.
- Fate-Root-Heath Co., Plymouth, Ohio.
"Plymouth" Gasoline Locomotives.
- Flexible Steel Lacing Co., 4607 Lexington St., Chicago, Ill.
Alligator and Flexco H. D. Belt Fasteners.
- Frog, Switch & Mfg. Co., Carlisle, Pa.
Manganese Steel Castings.
- General Electric Co., Schenectady, N. Y.
Electrical Apparatus and Supplies.
- Gill Rock Drill Co., Lebanon, Pa.
Blast Hole Drilling and Fishing Tools.
- The Goodyear Tire and Rubber Co., Inc., Akron, Ohio.
Belting: Transmission, Conveyor, Elevator; Hose, Packing.
- Graham Coal Co., Commercial Trust Bldg., Philadelphia, Pa.
Coal.
- Grasselli Powder Co., Cleveland, Ohio.
Manufacturers of Explosives.
- B. Greening Wire Co., Hamilton, Ontario, Canada.
Wire Rope.
- Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Manufacturer of Manganese Steel.
- George Haiss Mfg. Co., Inc., 141st St. & Rider Ave., New York City.
Truck Loaders, Portable Belt Conveyors, Tractors.
- Harnischfeger Corporation, 38th & National Aves., Milwaukee, Wis.
Electric Traveling Grab Bucket Cranes.
- The Hayward Co., 50 Church St., New York City.
Hayward Orange Peel and Clam Shell Buckets.
- The Hendrick Mfg. Co., Carbondale, Pa.
Perforated Metal Screens, Elevator Buckets.
- Hercules Powder Co., Wilmington, Del.
Explosives and Blasting Supplies.
- The Jeffrey Mfg. Co., Columbus, Ohio.
Elevating and Conveying Machinery.
- Keystone Lubricating Co., Philadelphia, Pa.
Lubricating Greases and Lubricating Devices.

- Koehring Company, Milwaukee, Wis.
Gasoline Shovels, Cranes and Draglines.
- Koppel Industrial Car and Equipment Co., Koppel, Pa.
Industrial and Portable Railway Material Work.
- The Loomis Machine Co., Tiffin, Ohio.
Blast Hole, Prospecting and Drilling Machinery and Tools.
- The Lubriko Co., Meadow and Jackson Sts., Philadelphia, Pa.
"Lubriko Greases."
- Manganese Steel Forge Co., Richmond St. and Erie Ave., Philadelphia, Pa.
"Rol-Man" Screens, Chains, Plates and Forged Products.
- The Marion Steam Shovel Co., Marion, Ohio.
Power Shovels and Cranes—Steam, Gasoline and Electric.
- Mid-West Locomotive Works, Cor. Spring Rd. and Alabama Ave., Cincinnati, Ohio.
Quarry Locomotives.
- The Morgan Engineering Co., Alliance, Ohio.
Crushers, Overhead Traveling Cranes and Mill Machinery.
- Mussens, Limited, Phillips Place Bldg., Montreal, Canada.
Rogers Timber Clamps, Mixers, Loaders.
- New York Belting & Packing Co., 91 Chambers St., New York City.
Conveyors, Elevator and Transmission Belting.
- Northern Explosives, Ltd., 623 Drummond Bldg., Montreal, Canada.
Blasting Supplies.
- The Ohio Locomotive Crane Co., Bucyrus, Ohio.
"The Ohio Crane."
- The Osgood Company, Marion, Ohio.
Power Shovels and Combinations.
- Pennsylvania Crusher Co., 1324 Stephen Girard Bldg., Philadelphia, Pa.
Stone, Coal and Lime Crushers.
- Pit and Quarry, Rand McNally Bldg., Chicago, Ill.
"Publishers."
- Quaker City Rubber Co., Wissinoming, Philadelphia, Pa.
Belting—Hose—Packing.
- Rock Products, 542 So. Dearborn St., Chicago, Ill.
"Publishers."
- Robins Conveying Belt Co., 13 Park Row, New York City.
Material Handling Equipment.
- The Sanderson-Cyclone Drill Co., Orrville, Ohio.
Drills, Big Blast Hole, Drilling and Fishing Tools.
- Shope Brick Co., East 8th and Division Sts., Portland, Oreg.
Concrete Brick.
- The Orville Simpson Co., 1230 Knowlton St., Cincinnati, Ohio.
Screens, ROTEX, level, self-cleaning, 100 to 3/4" mesh.
- Smith Engineering Works, 32nd and Locust Sts., Milwaukee Wis.
Rock Crushers—Gyratory, jaw and reduction.
- The Spencer Construction Co., Eastern Division—Macdonald Engineering Co.; Garrett Building, Baltimore, Md.
Contracting Engineers.
- Symons Bros. Co., Railway Exchange Bldg., Milwaukee, Wis.
Ore, Rock and Gravel Crushers.
- The Traylor Engineering & Mfg. Co., Allentown, Pa.
Crushing, Cement and Mining Machinery.
- S. G. Taylor Chain Co., 140 So. Dearborn St., Chicago, Ill.
Taylor Mesaba Steam Shovel Chains.
- Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
TISCO Manganese Steel Castings.
- The Thew Shovel Co., Lorain, Ohio.
Steam, Gasoline and Electric Shovels, Cranes, Draglines.
- Trojan Powder Co., Allentown, Pa.
Explosives and Blasting Supplies.
- Tredick Oil and Grease Co., Philadelphia, Pa.
Manufacturers of Petroleum Products.
- Vulcan Iron Works, Wilkes-Barre, Pa.
Steam, Gasoline, Electric Locomotives.
- The W. S. Tyler Co., Cleveland, Ohio.
Woven Wire Screens and Screening Equipment.
- George D. Whitcomb Co., Rochelle, Ill.
Gasoline Locomotives.
- Williams Patent Crusher and Pulverizer Co., 813 Montgomery St., St. Louis, Mo.
Hammer Crushers.
- G. H. Williams Co., Erie, Pa.
Cranes and Clam Shell Buckets.